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AIR POLLUTION TRAINING PROGRAMS

Public Health Service
Washington, D. C.

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air pollution training programs

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
Division of Air Pollution
Washington, D.C. 20201

preface

In recent years in the United States the public focus on the growing problem of air pollution has sharpened abruptly, and as a result there has been a sharp increase nationally in the demand for air pollution control. This demand for control which finds expression in the Clean Air Act of 1963 and the Amendments, creates in its wake the need for large numbers of personnel trained in the field of air pollution. Presently, there are roughly 1,000 persons in the United States who have been specially trained to work at controlling the problem. To do the job properly, it is estimated that we require seven times that number, and the almost inevitable growth of the problem in the future will require even greater numbers.

This catalogue lists the universities which offer graduate programs in the field of air pollution, and describes briefly what the programs consist of and what the entrance requirements are. At many of these universities students may apply for a stipend supported by the Air Pollution Training Grants Program of the Division of Air Pollution, U.S. Public Health Service. Under this program the Division of Air Pollution can also award a limited number of fellowships to individual students who wish to pursue particular graduate level studies in the biomedical or biometeorological aspects of air pollution, the socio-economic effects of the problem, or the engineering and physical science aspects of the problem. The catalogue describes what the requirements are for such fellowships, and describes how to apply for them. The catalogue also describes the programs presently offered by the University of Southern California and the Pennsylvania State University to train air pollution control specialists. Under both these programs trainees may apply for stipends supported by the training grants program of the Division of Air Pollution. The Division offers short term orientation or training courses in air pollution either in the field or at the Robert A. Taft Center in Cincinnati, Ohio, and these courses are also listed in the catalogue.

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Conditions Under Which Stipends Are Awarded

Stipends are awarded for the support of persons engaged full time in the preparation for a career in the field of air pollution.

The university program director has complete responsibility for the selection of students and for the allocation of funds from the Division of Air Pollution Training Grant. However, to receive a stipend from a graduate training grant the student must meet at least the following eligibility requirements:

a. Possess the Bachelor's degree or higher;
b. Meet the usual requirements of the graduate school of the grantee institution for admission as an advanced student and be enrolled, or eligible for enrollment, as a regular full-time graduate student;
c. Be appointed on a full-time basis, and
d. Be a citizen of the United States, a noncitizen admitted to the United States for permanent residence, or a noncitizen holding a temporary visa when such support was specifically proposed in the application as approved or when the program director obtains written permission from the awarding institute or division prior to appointment.

Institutions receiving grants are listed in the following pages together with courses given, degrees conferred, and the names and addresses of the program directors.

Participating Universities

UNIVERSITY OF CINCINNATI

Cincinnati, Ohio

The Department of Environmental Health offers graduate students an interdepartmental program leading to the M.Sc. (one year) or D.Sc. degree (three years and thesis). The course of study followed by any student is designed to meet his needs and stated professional objectives. In general, the M.Sc. program is designed to enable graduates to participate in all aspects of activities of governmental agencies, health departments, industrial or research institutions engaged in aspects of abatement and prevention of air pollution. The D.Sc. program is designed to develop administrators of environmental hygiene or air resources engineering programs, researchers, and teachers.

AIR POLLUTION COURSES

Air Sampling and Analysis I, II
Air Resources Engineering
Design of Environmental Control Systems
Environmental Sanitation
Environmental Systems Analysis and Design
Environmental Hygiene Technology
Epidemiology
Fundamentals of Environmental Chemistry
Public Health Meteorology

For additional information write to Program Director: Dr. Edward P. Radford, Jr., Professor and Head, Department of Environmental Health, University of Cincinnati, Eden and Bethesda Aves., Cincinnati, Ohio 45219.

COMMITTEE FOR INSTITUTIONAL COOPERATION

Under the leadership of the University of Illinois, Urbana, Illinois, the Committee for Institutional Cooperation (CIC), the Biometeorology Graduate Program is an integrated program in biometeorology based on the close coordination of eleven midwestern universities: Chicago, Illinois, Indiana, Iowa, Michigan, Michigan State, Minne-

sota, Northwestern, Ohio State, Purdue, Wisconsin.

Biometeorology is an interdisciplinary science which brings together the life sciences and the atmospheric sciences. The CIC graduate program aims to educate three types of environmental scientists: the student who majors in biology and minors in meteorology, the student who majors in meteorology and minors in biology, and the engineering student seeking to become competent in the biometeorological aspects of air pollution.

The CIC program leads in three years to the Doctor's degree. The trainee may study at more than one of the participating institutions, but will receive his degree from the department and institution where enrolled.

Students apply directly to the university of choice for enrollment. Application for training funds should be made to the Program Director, Dr. Frederick Sargent, at the University of Illinois. Final approval of applications is made by the Committee for Institutional Cooperation.

CIC INSTITUTIONS AND THEIR PROGRAMS

UNIVERSITY OF CHICAGO

There are doctoral programs in meteorology, geography, and ecology, though there is little work in biometeorology *per se*.

UNIVERSITY OF ILLINOIS

The Department of Geography offers a nonmathematical course on descriptive meteorology, an undergraduate course on agricultural climatology, and graduate work in climatology. Three graduate courses have been given jointly with the Department of Physiology: Fundamentals of Bioclimatology, Experimental Bioclimatology, and Advanced Bioclimatology.

INDIANA UNIVERSITY

A course is offered in Advanced Climatology. At Bloomington in the Department of Anatomy and Physiology there is a climatic

chamber with a treadmill, used for studies of human physiology in hot environments. At the medical school in Indianapolis there is a human environmental chamber in the Department of Physiology.

STATE UNIVERSITY OF IOWA

The Department of Physiology gives a lecture-seminar course on "Environmental Physiology." The Department of Geography offers courses in climatology and cartology. Biometeorology research in the Department of Physiology deals primarily with hibernation and biological rhythms in small animals and humans.

UNIVERSITY OF MICHIGAN

The Department of Meteorology has a graduate program leading to the Ph.D., including courses in micrometeorology, microclimatology, and micrometeorological instrumentation. Within the School of Public Health courses in epidemiology and biostatistics can be used toward a M.P.H. or Ph.D. There is an interdepartmental research program on air pollution and aeroallergens.

MICHIGAN STATE UNIVERSITY

The Department of Geography offers courses in biometeorology; courses in psychology, anthropology, and ecology contain a biometeorological viewpoint. Members of the Department of Physiology are investigating the effects of the physical environment on energy metabolism.

UNIVERSITY OF MINNESOTA

Courses are given in meteorology and biometeorology (aeronautically oriented), veterinary sciences, plant ecology and geography, glacial geology, insect ecology, and experimental ecology.

NORTHWESTERN UNIVERSITY

There are no special courses in biometeorology, but its concepts

are included in courses in ecology, entomology, and ornithology.

OHIO STATE UNIVERSITY

Courses applicable to a graduate program in biometeorology are Environment and Man, Environmental Toxicology, Industrial Engineering, Physical Measurements, Numerical Computation, Environmental Physiology, and Preventive Medicine.

PURDUE UNIVERSITY

Graduate course entitled "Bioclimatology of Domestic Animals" offered in alternate years.

UNIVERSITY OF WISCONSIN

In the Department of Meteorology there is a full range of courses leading to the Ph.D. degree, including a course on agricultural bioclimatology and a seminar using the ecological approach.

For additional information write to Program Director: Dr. Frederick Sargent II, Professor of Physiology, Department of Physiology and Biophysics, Graduate School, 524 Burrill Hall, University of Illinois, Urbana, Illinois 61803.

DREXEL INSTITUTE OF TECHNOLOGY

Philadelphia, Pennsylvania

The Air Resources curriculum offered by the Department of Environmental Engineering and Science provides a broad base of training in environmental sciences applicable to all areas of concern. It also provides for specialized training in depth in several specific areas of concern: air resources, water resources, radiological health, and industrial hygiene. Air resources was the first specialty offered when the program was initiated in 1963 and the others have been added since.

The present air resources curriculum (45 credits) leads to a Master

of Science degree in one year (three trimesters). A Doctoral degree program is contemplated.

AIR POLLUTION COURSES

Environmental Chemistry
Statistical Analysis I, II
Radiological Health
Meteorology
Environmental Physiology
Air Pollution Sources and Control
Air Sampling and Analysis
Heating and Ventilating Principles
Public Health Administration
Epidemiology
Air Pollution Distribution and Effects
Industrial Hygiene

For additional information write to Program Director: Dr. Henry C. Wohlers, Associate Professor, Department of Environmental Engineering and Science, Drexel Institute of Technology, 32nd and Chestnut Streets, Philadelphia, Pennsylvania 19104

UNIVERSITY OF FLORIDA

Gainesville, Florida

The purpose of this program of study offered by the Department of Civil (Sanitary) Engineering is to provide advanced, specialized education for graduate engineers and scientists in air pollution control. The program is arranged individually for each student. It is believed that although a student may be specializing in air pollution studies he should also have sufficient other related sanitary engineering courses to be aware of the problems of associated groups.

Ph.D. candidates take the entire series of air pollution courses plus additional courses in sanitary engineering to make up the major portion of their program. In addition to his major, the student takes a

minor and is required to complete a dissertation based on original research.

AIR POLLUTION COURSES

Man and His Environment
Occupational Health
Advanced Sanitary Engineering Practice
Atmospheric Pollution
Air Pollution Sampling and Analysis
Micrometeorology of Pollutant Dispersions
Air Pollution Control Measures

For additional information write to Program Director: Dr. Robert Sholtes, Department of Civil Engineering, Air Pollution Research Laboratory, University of Florida, Gainesville, Florida 32601.

HARVARD UNIVERSITY

Boston, Massachusetts

The purpose of the air pollution program in the School of Public Health is to organize and expand a comprehensive research-oriented training program in atmospheric pollution aspects of environmental health, including basic research on biological or physical and chemical aspects, engineering, economics, planning, and administration.

Degree programs lead to a M.P.H., D.P.H., M.Sc. in Hygiene, D.Sc. in Hygiene, or Master of Industrial Health degree.

Candidates for the M.Sc. in Hygiene are required to take courses in three categories: courses specifically related to air pollution measurement and control, courses dealing with specific biologic effects of air pollution, and a basic course in biostatistics and epidemiology.

Candidates for the M.P.H. degree take a broad program in public health disciplines, including basic courses in biostatistics, epidemiology, public health administration, and environmental sciences and engineering. About half of such a program would be devoted to courses having a specific relationship to air pollution.

AIR POLLUTION COURSES

Industrial Air Analysis
Aerosol Technology
Community Air Pollution
Biostatistics and Epidemiology
Toxicology of Air Contaminants
Basic Problems in Occupational Health and Industrial Environments
Toxicology and Radiation Biology
Air Pollution Control

For additional information write to Program Director: Dr. J. Whittenberger, Department of Industrial Hygiene, School of Public Health, Harvard University, 665 Huntington Avenue, Boston, Massachusetts 02115.

UNIVERSITY OF MICHIGAN

Ann Arbor, Michigan

The purpose of the air pollution program offered in the School of Public Health is to train graduate students of engineering and physical sciences in research in the development of air pollution control methods, and to expand the numbers of such air pollution oriented scientists available to government and industry.

Graduate degree candidates in the Departments of Engineering and Meteorology as well as the School of Public Health are eligible to participate in the interdepartmental air pollution training program. All participants take the four core courses listed below.

All Master's degree candidates take an Interdepartmental Seminar for two semesters; Ph.D. candidates are required to attend a total of four semesters, in one of which they will present a report on their research and thesis project.

AIR POLLUTION COURSES

Core Courses:

Combustion and Air Pollution Control
Health Factors in Air Pollution
Interdisciplinary Seminar in Air Pollution
Air Pollution Meteorology

Two additional courses are required of Ph.D. candidates and Master's candidates in the Air Pollution Program for more than one year:

Analysis of Air Pollutants
Advanced Seminars in Air Pollution

For additional information write to Program Director: Professor Harold J. Magnuson, M.D., Chairman, Department of Industrial Health, School of Public Health, W5634 University Hospital, University of Michigan, Ann Arbor, Michigan 48104.

UNIVERSITY OF MINNESOTA

Minneapolis, Minnesota

The Air Pollution Control Training Program of the Environmental Health Section of the School of Public Health has two aims: (1) to increase the number of competent, well-trained engineers, chemists and other scientists available for research and training in the technical aspects of air pollution and air pollution control; (2) to indoctrinate students of different disciplines and from different departments of the University with problems of air pollution in community life.

A candidate for the M.S. or M.P.H. degree in Environmental Health with specialization in air pollution control takes the core curriculum listed below and elective courses suitable for his academic background.

The candidates for the Ph.D. degree are selected from students in the Master's program with a suitable science background. They major in Environmental Health and minor according to their academic background in a minimum three-year program.

AIR POLLUTION COURSES

Core Curriculum for M.S. or M.P.H. Degree:

Elements of Public Health I, II, and III
Environmental Sanitation
Epidemiology I
Public Health Administration
Biostastistics I
Biostatistics Laboratory I
Sanitary Biology
Public Health Education
Administration of Public Health Nursing
Public Health Seminar
Environmental Health Seminar

Specialty Courses, M.S. or M.P.H. Degree:

Introduction to the Air Pollution Program
Air Pollution Control
Air Analysis
Air Pollution Problems
Topics in Air Pollution Control
Industrial Hygiene Engineering
Control of Radiation Hazards

Courses for Ph.D. Degree:

Epidemiology II
Epidemiology of Noncommunicable Diseases
Radiological Health II
Air Pollution Problems
Heterocyclic Compounds
Chemistry of Combustion

Original research leading to a thesis is also required.

For additional information write to Program Director: Dr. Gaylord Anderson or Professor Harold Paulus, School of Public Health, University of Minnesota, Minneapolis, Minnesota 55455.

NEW YORK UNIVERSITY
Chemistry Department
New York, New York

The program offered by the Chemistry Department is a highly theoretical training program in chemistry, training mainly post-doctoral students. The program is divided into two categories: (1) reactions of atmospheric gases; and (2) correlation of the structure of organic air pollutants with carcinogenicity.

In order to train the individuals to tackle different problems of air pollution in the field of basic chemistry, the following program is offered:

1. Lectures and seminars on the basic concepts of quantum chemistry.
2. Lectures and seminars on radio chemistry.
3. Training in the computing techniques required to solve the above problems.
4. Theoretical study of the photochemical reactions of the atmospheric gases.
5. Theoretical study of bond orders, free valences, resonance energies, and excitation energies of polycyclic hydrocarbons.
6. Seminars in numerical analysis.
7. Seminars in special functions.
8. Seminars in numerical integration methods.
9. Seminars in Eigenvector-Eigenvalue problems.
10. Lectures on multicenter integrals.
11. Lectures in molecular spectra.
12. Lectures in molecular quantum mechanics, and
13. Seminars in the quantum mechanical study of hydrocarbons occurring as air pollutants.

For additional information write to Program Director: Dr. R. C. Sahni, Senior Research Scientist, Department of Chemistry, New York University, Bronx, New York 10453.

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NEW YORK UNIVERSITY
Department of Civil Engineering
New York, New York

The purpose of this program in the Department of Civil Engineering is to offer graduate students a coordinated interdepartmental program leading to the M.S. degree in either Civil Engineering, Chemical Engineering, or Meteorology with a strong common minor in the field of air pollution. In this way it is hoped not only to train students so that they may participate in air pollution control and research programs, but also to increase their technical competence in the field of individual specialization, so that advanced graduate work in an air pollution related field will be possible.

The training course covers a full calendar year. Formal course work is taken in the fall and spring semester, while the summer is devoted to thesis research or to participation in an existing on-campus research project and writing of a research paper.

All students are required to take at least five of the courses listed below. The total requirement for the Master's degree is 36 units. Additional course electives, including research thesis or other departmental requisites for the degree comprise the balance. The degree is granted by the Department having academic jurisdiction over the student.

AIR POLLUTION COURSES

Air Pollution Analysis
Air Pollution Chemistry
Microclimatology
Dispersion of Pollutants in the Atmosphere and Oceans
Environmental Health Engineering—Air Pollution Engineering Control
Air Pollution Effects

For additional information write to Program Director: Dr. Alan M. Molof, Associate Professor, Department of Civil Engineering, New York University, Bronx, New York 10453.

OREGON STATE UNIVERSITY

Corvallis, Oregon

This program provides academic and research training for the M.S. and Ph.D. degrees to prepare engineers for professional careers in atmospheric pollution control in public and private agencies and industries concerned with solving the problems of air pollution.

Requirements for the M.S. degree are 30 hours in the major field and 15 hours in the minor. For the Ph.D. degree 135 hours are required, of which 80 are in the major and 30 to 50 are allotted to the thesis.

Core courses required of students emphasizing air pollution engineering and air pollution meteorology are listed below.

AIR POLLUTION COURSES

Fundamentals of Air Sanitation
Measurement and Control of Air Pollutants
Industrial Hygiene
Seminar on Atmospheric Environment
Thesis

For additional information write to Program Director: Dr. Richard W. Boubel, Associate Professor of Mechanical Engineering, Oregon State University, Corvallis, Oregon 97331.

PENNSYLVANIA STATE UNIVERSITY

University Park, Pennsylvania

Programs of study for students under the graduate Air Pollution Training Program in the Center for Air Environment Studies include minor sequences in the air pollution area. The University requirements for minors are a minimum of six credits of integrated or articulated work in one field for the M.A. or M.S. degrees and fifteen credits for the Ph.D. Approval of a program will depend on whether it meets the University requirements and reflects a significant commitment to air pollution problems.

Suitable programs to supplement a minor sequence in Air Pollution are available from such departments as botany, biochemistry, plant pathology, zoology, forestry, veterinary science, civil engineering, meteorology, journalism, political science, psychology, sociology, chemistry, economics, and geography.

AIR POLLUTION COURSES

Introduction to Air Pollution
Air Pollution Seminar
Small Particle Technology
Air Pollution Effects on Biological Systems
Public Planning and Development Administration in the United States

For additional information write to Program Director: Dr. Seymour Calvert, Director, Center for Air Environment Studies, 301 Engineering Unit "C", Pennsylvania State University, University Park, Pennsylvania 16802.

UNIVERSITY OF PITTSBURGH

Pittsburgh, Pennsylvania

The three major purposes of the air pollution program in the School of Public Health are: (1) to develop practitioners in the field of air pollution to fill positions in government and industry; (2) to develop high-caliber researchers in aerosol physics; and (3) to make available courses in air pollution to candidates in other programs.

Requirements for the M.Sc. degree are 36 to 38 credits. In addition to the air pollution courses listed below, degree programs include courses in biostatistics, epidemiology, physiology, and toxicology.

AIR POLLUTION COURSES

Water and Air Chemistry Principles and Laboratory
Air Pollution Principles

Air Pollution Measurements
Properties of Dusts, Smokes, and Mists
Air Pollution Practice

For additional information write to Program Director: Dr. Morton Corn, Associate Professor of Industrial Health and Air Engineering, Graduate School of Public Health, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, Pennsylvania 15213.

UNIVERSITY OF SOUTHERN CALIFORNIA

Los Angeles, California

The purpose of the training program in the School of Medicine is to provide two years of advanced training for M.D.'s in Applied Pulmonary Physiology, and Pulmonary Diseases with a foundation and orientation in the basic aspects of air pollution and its biological effects on health.

Trainees engage in independent research under supervision of a senior member of the faculty, and attend weekly seminars and other clinical conferences, seminars, and lectures.

The training program has four segments:

a. *Basic Atmospheric Sciences:*

The purpose of this segment is to provide formal training in depth in specific aspects of the total air pollution problem which are important for future pulmonary physician-physiologists.

b. *Thoracic Medicine:*

The purpose of this segment, covering a six-month period is to provide intensive and realistic experience in the management of patients with pulmonary disease and an understanding of the natural history, patho-physiology, and social and environmental factors related to respiratory diseases.

c. *Pulmonary Physiology:*

During this one-year period, Fellows receive detailed instruc-

tion concerning ventilatory function, respiratory gas exchange, and applied physiology of exercise.

d. *Independent Study and Research:*

During the final six months, each trainee will be encouraged to select a problem in the field of pulmonary physiology, pathology, or disease with or without relevance to air pollution and to pursue it in depth.

For additional information write to Program Director: Dr. Clayton G. Loosli, Hasting Professor of Medicine, School of Medicine, University of Southern California, 2025 Zonal Avenue, Los Angeles, California 90033.

SYRACUSE UNIVERSITY

Syracuse, New York

This program, offered by the Department of Civil Engineering, is designed to train civil, mechanical, sanitary, and chemical engineers interested in pursuing a specialist career in professional air pollution activities—control and administration—in government or industry.

Degree requirements are as follows: for the M.S., 32 credits, including 12 credits in a minor, for example public administration or environmental engineering. For the Ph.D. 90 credits are required.

AIR POLLUTION COURSES

Atmospheric Sanitation I, II
Physics and Meteorology of the Lower Atmosphere
Planning, Organization, and Administration in Air Pollution Control
Biological and Health Effects of Air Pollution

For additional information write to Program Director: Dr. Morris Katz, Professor, Department of Civil Engineering, Syracuse University, Syracuse, New York 13200.

TEMPLE UNIVERSITY

Philadelphia, Pennsylvania

The objective of this program in the Department of Chemistry in the School of Pharmacy is to offer a twelve-month research training program in the toxicology of air pollutants leading to the Master of Science degree in Environmental Health. This program consists of disciplines to equip the trainees for research positions with various agencies and laboratories that are involved in air pollution studies.

There is a fixed curriculum which all students complete. No electives are offered. The program is primarily designed to equip the trainee with a suitable background to do biomedical research related to air pollution studies.

AIR POLLUTION COURSES

First Semester:

Epidemiology
Statistics
Radioecology
Toxicology I
Introduction to Research (Use of library; theory and methods in ultra violet, visible, infra-red spectrophotometry and fluorometry)

Second Semester:

Public Health Administration
Organic Analysis
Ecology Lab
Toxicology II
Special Topics (biomedical research in air pollutants)

Summer:

Special topics and field experience

For additional information write to Program Director: Dr. Samuel Elkins, Associate Professor of Chemistry, Department of Chemistry

in the School of Pharmacy, Temple University, 3223 North Broad Street, Philadelphia, Pennsylvania 19140.

TEXAS A & M UNIVERSITY

College Station, Texas

Air pollution training, given in the Department of Plant Sciences, is limited to students in the areas of botany, meteorology, and zoology. The training covers two broad areas: (1) field training in the quantitative and qualitative measurements of pollutants, and (2) laboratory training in fumigation and analytical techniques. During the summer months intensive training is given in the detection and measurement of pesticides. Field training in particulate air pollution is given during the fall and spring months.

Twice a month seminars are held on some subject germane to air pollution. Usually one is by an academic, medical, or governmental employee working in the field of air pollution. The other is usually held in connection with a trip to an industrial plant or government air pollution agency.

AIR POLLUTION COURSES

Applied Climatology
Agricultural Meteorology (principles of meteorology as applied to agriculture)
Agricultural Meteorology (application of physical concepts)
Introduction to Plant Physiology
Plant Growth and Development
Plant Ecology
Advanced Plant Ecology
Environmental Measurement and Interpretation

For additional information write to Program Director: Dr. Howard Applegate, Associate Professor, Department of Plant Sciences, Texas Agricultural Experiment Station, Texas A & M University, College Station, Texas 77843.

TULANE UNIVERSITY

New Orleans, Louisiana

The aim of the present program, in the Department of Medicine, is to equip young physicians with the laboratory and clinical skills necessary for the diagnosis and investigation of pulmonary and allergic disorders. Two years of training are required for this program which is offered to post-doctoral trainees.

More than 50 percent of the trainees' time is spent in the pulmonary research and allergy laboratories, their programs being individualized according to their needs for specialty training.

An active investigative program which provides experience in research is maintained by the Pulmonary Diseases and Allergy Units. The trainees are thoroughly grounded in clinical pulmonary diseases and allergy during the program, serving as teaching fellows in chest physiology, and perform general medical services to Tulane Medical School at Charity Hospital.

Trainees are required to attend a limited number of special courses, most of which are of the seminar type as follows: (1) effect of noxious atmospheric substances on pulmonary function and the diseases they produce, (2) assisted ventilation of patients with acute and chronic respiratory failure, (3) evaluation of the degree of pulmonary disability by clinical and physiological methods, and (4) rehabilitation of patients with chronic respiratory disorders.

Trainees are required to attend the following:

Pulmonary physiology and applied immunology seminars
Immunology course
Special post-graduate seminars in the Department of Physiology
Special short lectures
Monthly meetings of the Thoracophilus Society (a group of full-time workers in pulmonary diseases who present research results at monthly meetings).

For additional information write to Program Director: Dr. Morton M. Ziskind, Professor of Medicine, Department of Medicine, Tulane

University School of Medicine, 1430 Tulane Avenue, New Orleans, Louisiana 70112.

UNIVERSITY OF UTAH

Salt Lake City, Utah

The purpose of this program in the Department of Botany is to provide a broad training in plant biology and air pollution to students at the graduate level. The students are selected for a good background in biology and physical sciences. They engage in research on the effects of air pollutants on plants with emphasis on physiology or symptomatology. The latter field is selected because plants are excellent indicators of the presence of air pollutants when the symptomatic responses can be distinguished from those of pathogenic or physiological disturbances.

The trainees major in biological and physical sciences and minor in air pollution science. The degree requirements for the M.S. are 33 hours in major subjects and 12 hours in the minor; and for the Ph.D., 60 hours in the major and 30 hours in the minor.

AIR POLLUTION COURSES

Environmental Toxicology
Methods and Evaluation
Air Pollution Science Seminars
Advanced Seminar
Radiological Health

For additional information write to Program Director: Dr. Michael Treshow, Assistant Professor, Department of Botany, University of Utah, Salt Lake City, Utah 84112.

VANDERBILT UNIVERSITY

Nashville, Tennessee

The objectives of this program are to produce engineers competent in the theoretical and applied aspects of sanitary engineering; to

stimulate research activities in areas where data are scarce; and to promote the interest of new and desirable personnel in all phases of Environmental Health Engineering.

Trainees specialize in air resources engineering in curricula leading to the M.S. and Ph.D. degrees in sanitary engineering. The M.S. degree program (12 to 18 months) requires 24 semester hours (8 in major) and a thesis; or 30 hours (12 in major) and an examination. Requirements for the Ph.D. degree are a dissertation, comprehensive examination in the major and two minors, and reading knowledge of two foreign languages. Minor fields include other engineering disciplines, natural and social sciences, and law.

AIR POLLUTION COURSES

Atmospheric Pollution
Epidemiology
Biostatistics
Lecture and Lab Course

For additional information write to Program Director: Dr. Peter A. Krenkel, Associate Professor and Director, Sanitary and Water Resources Engineering, Department of Civil Engineering, School of Engineering, Box 1670, Station B, Vanderbilt University, Nashville, Tennessee 37203.

UNIVERSITY OF WASHINGTON

Seattle, Washington

The air resources program is designed to provide specialized training in air resources engineering for engineering candidates for the M.S. degree, who expect to join air pollution control programs in Federal, State, or local governments, or in private industry or consulting firms. It is also designed for study and research leading to the Ph.D. degree.

The program is sponsored by the Department of Civil Engineering with the cooperation of the Department of Atmospheric Sciences.

Supplemental courses are available from other engineering disciplines, health sciences, social and political sciences, and public administration.

The M.S. degree program (one year) requires a thesis. Requirements for the doctorate include a program of study and research acceptable to the candidate's advisor and a supervisory committee, a dissertation which is a significant contribution to air pollution knowledge, and a general examination in air resources and in a minor supporting field.

AIR POLLUTION COURSES

Air Resources Engineering I, II
Air Resources Management
Topics in Environmental Health Engineering
Air Conditioning (Industrial Ventilation and Gas Cleaning)
Chemistry of Air Pollution
Aerosol Science and Technology I, II

For additional information write to Program Director: Dr. August T. Rossano, Jr., Research Professor, Department of Civil Engineering, College of Engineering, University of Washington, Seattle, Washington 98105.

WEST VIRGINIA UNIVERSITY

Morgantown, West Virginia

The purpose of this program in the Department of Civil Engineering is to provide trainees with a technical background in the methods of obtaining concerted action for the improvement of public health practices, community planning, conservation of natural resources, and industrial development as they relate to the air pollution problem.

Thirty hours of course work plus a project or 36 hours of course work are required for the M.S.E. degree. The program can also lead to a Ph.D.

AIR POLLUTION COURSES

Properties of Air Pollutants
Air Pollution Control Engineering
Air Pollution Control Standards
Air Pollution Control Programs
Solid Waste Disposal

For additional information write to Program Director: Dr. Benjamin Linsky, Department of Civil Engineering, College of Engineering, West Virginia University, Morgantown, West Virginia 26506.

YALE UNIVERSITY

New Haven, Connecticut

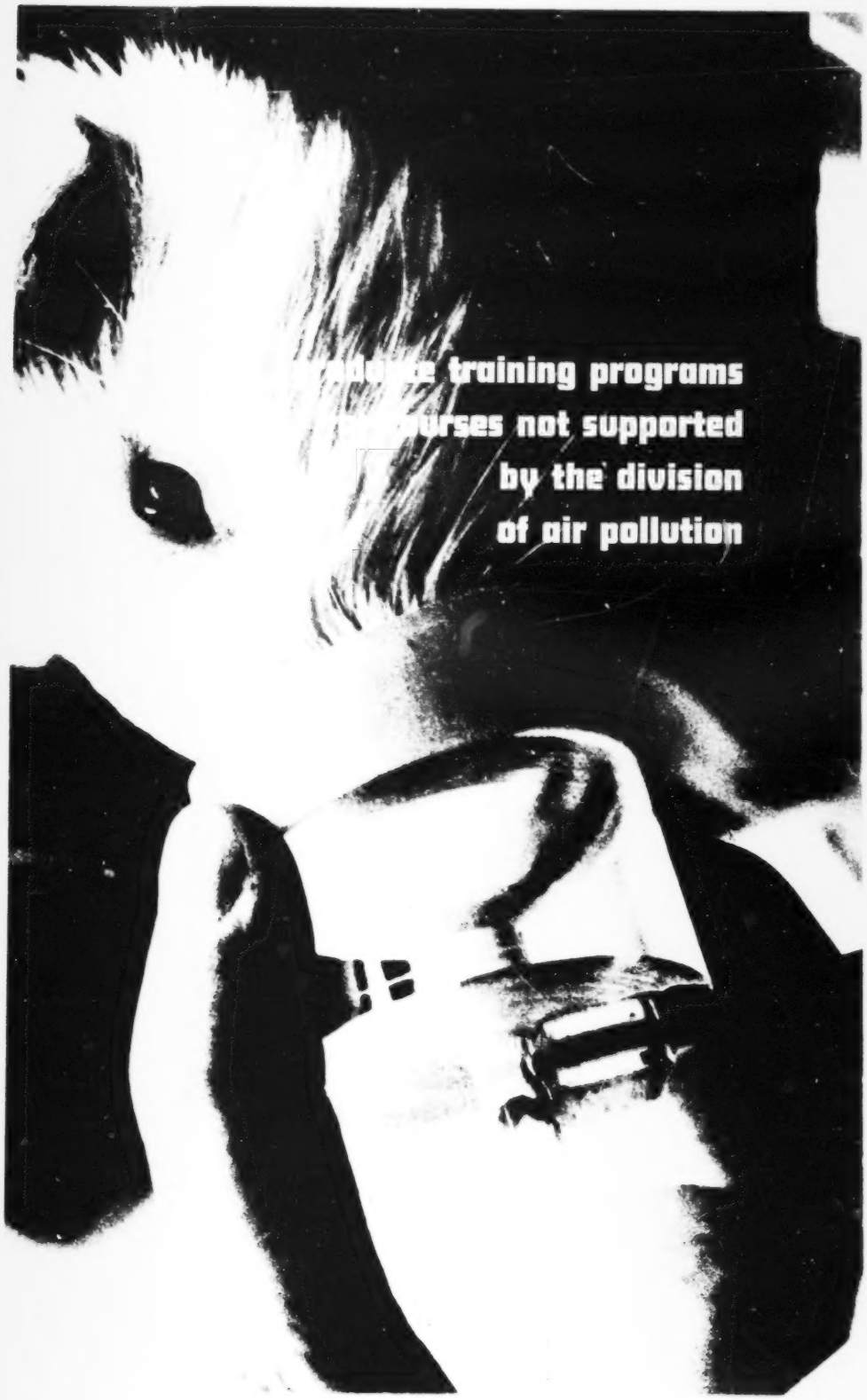
The objective of this program in the School of Medicine, is to develop environmental epidemiologists and other specialists to study and research the interrelationships between air pollution and human health.

Four semesters, one 10-week summer session, and a thesis are required for the M.P.H. degree.

AIR POLLUTION COURSES

Control of Community Air Pollution
Air Sampling and Analysis
Readings in Air Resources and Pollution
Health Effects of Air Pollution
Epidemiology (research)
Public Health Practice (research)
Air Pollution Meteorology

For additional information write to Program Director: Eric W. Mood, Assistant Professor of Public Health, School of Medicine, Yale University, New Haven, Connecticut 06500.


training programs
not supported
by the division
of air pollution

CITY COLLEGE OF NEW YORK

New York, New York

Program Director: Richard G. Coulter
Professor, Department of Civil Engineering
City College of New York
Convent Avenue at 138th Street
New York, New York 10031

AIR POLLUTION COURSES

First Semester:

Atmospheric Contamination and Sanitation
Air Pollution Meteorology
Air Pollution Sampling and Analysis

Second Semester:

Control of Atmospheric Emissions
Air Pollution Surveys
Air Pollution Control Programs

CLEMSON UNIVERSITY

Clemson, South Carolina

Program Director: Dr. Forest Alley, Associate Professor
Department of Chemical Engineering
Clemson University
Clemson, South Carolina 29631

AIR POLLUTION COURSES

Atmospheric Chemistry
Industrial Air Hygiene
Air Pollution Control Processes
Meteorology

COOPER UNION

New York, New York

Program Director: Dr. Aaron J. Teller
Dean, School of Engineering and Science
Cooper Union
51 Astor Place
New York, New York 10003

AIR POLLUTION COURSES

Interdisciplinary:

Material Science
Numerical Analysis
Transport Phenomena
Thermodynamic Behavior
Graduate Humanities Seminar

Air Pollution Control:

Aspects of Air Pollution
Air Pollution Control Systems

Elective Courses:

Six credits in engineering design from specialized courses in chemical, civil, mechanical or electrical engineering

Thesis:

Exploratory design in air pollution control

ILLINOIS INSTITUTE OF TECHNOLOGY

Chicago, Illinois

Program Directors: Dr. C. Fred Gurnham
Dr. Robert B. Grieves
Department of Civil Engineering
Illinois Institute of Technology
Chicago, Illinois 60616

AIR POLLUTION COURSES

Air Pollution: sources and control; chemistry and thermodynamics of the atmosphere; atmospheric diffusion and stack meteorology; techniques of air sampling and analysis; equipment and processes for air pollution abatement, including pollutant disposal, gas cleaning, and gas purification.

Unit Operations of Sanitary Engineering: fluid transport in closed and open conduits, mixing, sedimentation, flow through beds, filtration, gas transfer, heat transfer, and other physical unit operations of interest to sanitary engineers.

These evening courses are offered for graduate credit toward the M.S.S.E. or other degree, or may be taken as isolated courses. Assistantships and fellowships are available for graduate students in sanitary engineering, for both the M.S. and Ph.D. degrees.

UNIVERSITY OF NORTH CAROLINA

Chapel Hill, North Carolina

Program Director: Dr. Emil T. Chanlett
Professor of Sanitary Engineering
Department of Environmental Sciences and Engineering
School of Public Health
University of North Carolina
Chapel Hill, North Carolina 27514

AIR POLLUTION COURSES

Man and His Environment
Elements of Environmental Biology
Reading in Air and Industrial Hygiene
Elements of Air Hygiene
Elements of Industrial Hygiene
Applied Physiology and Toxicology
Control of the Institutional Environment

Planning and Development of Environmental Hygiene Programs
Systems Analysis in Environmental Planning
Problems in Air and Industrial Hygiene
Mechanics of Aerosols
Industrial Hygiene Practices
Air and its Gaseous Contaminants
Air and Industrial Hygiene Laboratory
Community Air Pollution
Biological Effects of Air Pollution
Chemistry of the Troposphere
Public Investment Theory and Techniques
Environmental Health Problems in Developing Countries
Research in Air and Industrial Hygiene

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Requirements, Qualifications, and Terms of Fellowships

As authorized by the Clean Air Act, the Public Health Service, Division of Air Pollution, has established a grants-in-aid program to increase the number, competence, and knowledge of professional personnel engaged in research and other activities related to the prevention and abatement of air pollution. A limited number of special fellowships for graduate-level study in the engineering and physical sciences, biomedicine and socioeconomic aspects of air pollution will be awarded to individuals desirous of obtaining such specialized training and instruction. In addition, special fellowships will be awarded to individuals who wish to acquire specialized graduate training in biometeorology.

Air pollution special fellowships are awarded and administered in accordance with the following policies and procedures:

REQUIREMENTS

A special fellow must be a citizen of the United States a noncitizen national of the United States, or must have been lawfully admitted to the United States for permanent residence. No documentation is required of an applicant who is a citizen or noncitizen national of the United States. An applicant who is not a United States citizen or a noncitizen national must request the Office of the Immigration and Naturalization Service nearest his residence to inform the Public Health Service (Career Development Review Branch, Division of Research Grants, National Institutes of Health, Bethesda, Md. 20014) that he was lawfully admitted to the United States for permanent residence. The request to the Immigration and Naturalization Service must be made on that agency's form N-585, available in any I. & N. S. office.

QUALIFICATIONS

To qualify for a fellowship an applicant must have at least a bachelor's degree from an institution offering a recognized degree, and must be accepted for admission by an educational or training institution offering a recognized degree.

At the post-master-degree level the applicant must in addition have

a master's degree from an institution offering a recognized degree.

At the post-doctoral level the applicant must have a doctoral degree from an institution offering a recognized degree.

In awarding the fellowship, consideration will be given by the Public Health Service to the adequacy, value, and appropriateness of the course or courses to be taken, and the qualifications, interest, and potential contribution of the individual.

TERMS OF FELLOWSHIPS

Fellowships are awarded on a 12-month basis, with possible opportunity for continuation. The fellow is expected to pursue a full-time training program. If support is desired for more than one year, justification of the additional training should be furnished at the time the initial application is made. Support for additional training will, in all cases, depend upon a satisfactory progress report from the sponsor and the availability of funds appropriated by the Congress for this program.

HOW TO APPLY

Applications for Air Pollution Special Fellowships may be secured from any of the Regional Offices of the Public Health Service or from the Chief, Research and Training Grants Branch, Division of Air Pollution, Bureau of State Services, United States Public Health Service, Department of Health, Education, and Welfare, 8120 Woodmont Avenue, Bethesda, Maryland 20014.

The following table shows deadlines for submitting applications and the corresponding review dates:

Deadline for PHS Receipt	*Review Dates*
May 1	October
October 1	February
February 1	May

Notification is given approximately two weeks after review.

Regional Offices

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

Region I	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont: John Fitzgerald Kennedy Federal Building, Boston, Massachusetts 02203
Region II	Delaware, New Jersey, New York, Pennsylvania: Room 1200, 42 Broadway, New York, New York 10004
Region III	District of Columbia, Kentucky, Maryland, North Carolina, Virginia, West Virginia, Puerto Rico, Virgin Islands: 700 East Jefferson Street, Charlottesville, Va. 22901
Region IV	Alabama, Florida, Georgia, Mississippi, South Carolina, Tennessee: Room 404, 50 Seventh St., N.E., Atlanta, Ga. 30323
Region V	Illinois, Indiana, Michigan, Ohio, Wisconsin: Room 712, New Post Office Building, 433 West Van Buren Street, Chicago, Illinois 60607
Region VI	Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota: 601 East 12th Street, Kansas City, Missouri 64106
Region VII	Arkansas, Louisiana, New Mexico, Oklahoma, Texas: Ninth Floor, 1114 Commerce St., Dallas, Texas 75202
Region VIII	Colorado, Idaho, Montana, Utah, Wyoming: Room 9017, Federal Office Building, 19th and Stout Streets, Denver, Colorado 80202
Region IX	Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washington, Guam, American Samoa: 447 Federal Office Building, 50 Fulton Street, San Francisco, California 94102

grants from the
division of air pollution

At present there are two Air Pollution Control Institutes to train air pollution control specialists. One is at the University of Southern California in Los Angeles, the other at Pennsylvania State University, University Park, Pennsylvania.

Application for admission to these programs should be made to the institution, which selects students according to its own requirements and standards.

Air Pollution Control Institute
University of Southern California
Los Angeles, California 90012
Program Director: Dr. Frank J. King

This program to train air pollution control administrators started its first class January 10, 1966. The six-month program is sufficiently flexible in scope and depth to give a working understanding of the administrative aspects of air pollution control concepts and operations. Added to this, a review of engineering-physical sciences and biological-medical elements provides an appreciation of the technical components. This combination of study meshes the multiple skills vital to the effective administrator.

Each program includes approximately three months of seminar instruction at the University, coupled with an equivalent time devoted to field investigations and study visits to industries, laboratories, and other operating and research agencies. In particular, field training includes source testing, air sampling, preparation of emission estimates, investigation of complaints, laboratory analysis of contaminant samples, and evaluation of pollution control systems.

Seminar and field exercises are integrated throughout the program to allow comparison of theory and practice, and to promote comprehension of the interrelationships between administration and technology. In addition to lectures, discussions, and field exercises, learning techniques include management simulation exercises, decision-making games, and role-playing and case-study analysis. In lieu of a dissertion, the program provides up to 12 hours of graduate credit towards a graduate degree in public administration to qualified applicants.

Stipends are determined on an individual basis.

Pennsylvania State University
Center for Air Environment Studies
University Park, Pennsylvania 16802
Program Director: Dr. Seymour Calvert

This program is designed to train air pollution control administrators and air pollution control technicians. The administrators receive ten weeks of intensive training in engineering and physical sciences, and biomedical and socioeconomic and administrative areas.

Trainees are selected from junior and senior undergraduate students. Criteria for selection are based on the student's indication that after the University phase of the training he would be interested in pursuing a career in air pollution and would go to an Air Pollution Control Office for additional training.

Trainees receive a stipend of $750 for the ten weeks. The program provides up to eight hours of graduate credits.

The applicants for technician training are selected from two-year Associate Engineering Schools. These trainees receive seven weeks of intensive training on air Pollution instrumentation (use-theory of operation, etc.). After the seven weeks of training they also receive additional training, one day per month for nine months (on Saturday), of the seminar type to give them a well-rounded education. These students receive a stipend of $525 for the seven weeks training and $25 per day for the additional nine one-day seminars.

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The Division of Air Pollution offers short-term orientation and training courses designed for personnel working in various areas of the air pollution problem. The courses run variously from a few days to two weeks and are given both in the Robert A. Taft Sanitary Engineering Center at Cincinnati and in the field.

Courses are designed for scientists, engineers, and other professional people in the field of air pollution. They provide effective means of consideration and appraisal of the newest developments in air pollution with opportunity for practice in the application of the latest techniques. Training is given in lectures supplemented by visual aids and closed circuit television, demonstrations, problem sessions, and panel discussions. Laboratory and field practice, where applicable, give opportunity to acquire proficiency in the new techniques under the guidance of experts. A few broad-coverage courses are offered for those in technical administrative positions who wish to acquire an overall perspective in specific areas.

Design of Air Pollutant Sampling Trains
Source Sampling for Atmospheric Pollutants
Sampling and Identification of Aero-allergens
Introduction to Microscopic Analysis
Elements of Air Quality Management
Atmospheric Survey
Air Pollution Data Evaluation
Microscopic Analysis for Atmospheric Particulates
Measurement of Airborne Radioactivity
Diffusion of Air Pollution—Theory and Application
Combusion Evaluation—Sources and Control Devices
Analysis of Atmospheric Organics
Analysis of Atmospheric Inorganics
Medical and Biological Aspects of Air Pollution
Legal Aspects of Air Pollution
Elements of Air Quality Management
Public Information and Community Relations
Meteorological Aspects of Air Pollution
Control of Particulate Emissions

Control of Gaseous Emissions
Community Air Pollution
Introduction to Control
Source Sampling Techniques
Orientation in Air Pollution
Technical Orientation in Air Pollution
Atmospheric Allergen Sampling

For additional information write to Mr. George Walsh, Chief, Air Pollution Training, Robert A. Taft Sanitary Engineering Center, U.S. Department of Health, Education, and Welfare, Public Health Service, Cincinnati, Ohio 45226

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